

## CLAIMS

1. A noise reduction apparatus for signal light is arranged in the transmission path of this signal light in order to reduce noise of the signal light in optical communication  
5 and a carbon nanotube is used as a saturable absorber.

2. The noise reduction apparatus for signal light according to claim 1, wherein said carbon nanotube has optical non-linearity.

3. The noise reduction apparatus for signal light  
10 according to claim 1 or 2, wherein said saturable absorber has a function as an optical isolator in respect of light propagated in the opposite direction to said signal light by combination with an optical amplifier.

4. The noise reduction apparatus for signal light  
15 according to any of claims 1 to 3, wherein said saturable absorber has the function of a waveform shaper in respect of said signal light.

5. The noise reduction apparatus for signal light according to any of claims 1 to 4, wherein the wavelength zone  
20 of said saturable absorber that is capable of saturable absorption is at least 1200 nm but no more than 2000 nm.

6. The noise reduction apparatus for signal light according to any of claims 1 to 5, wherein said signal light is signal light that is emitted from an optical fiber amplifier.

25 7. The noise reduction apparatus for signal light according to claim 6, wherein said optical fiber amplifier is an erbium-doped optical fiber amplifier.

8. The noise reduction apparatus for signal light according to any of claims 1 to 5, wherein said signal light is signal light emitted from a semiconductor optical amplifier.

9. The noise reduction apparatus for signal light  
5 according to any of claims 1 to 5, wherein said signal light is signal light emitted from a semiconductor laser.

10. The noise reduction apparatus for signal light according to any of claims 1 to 7, wherein said saturable absorber is provided as a repeater between each adjacent said  
10 optical fiber amplifier when a plurality of said optical fiber amplifier stages are provided consecutively in said transmission path.

11. The noise reduction apparatus for signal light according to any of claims 1 to 10, wherein said carbon  
15 nanotube is either or both of a single-wall carbon nanotube or multi-wall carbon nanotube.

12. The noise reduction apparatus for signal light according to any of claims 1 to 11, wherein said saturable absorber is provided on a transparent optical component.

20 13. A method of noise reduction of signal light, wherein a carbon nanotube is arranged as a saturable absorber in the transmission path of signal light in optical communication, noise of the signal light being reduced by means of the saturable absorber.